Section 10.3 Solving Quadratic Equations by the Quadratic Formula

# Objective 1: Using the Quadratic Formula

Any quadratic equation can be solved by completing the square. By completing the square for a general quadratic equation $ax^{2}+bx+c=0$, we derive the **quadratic formula**.

Because the quadratic formula is derived by completing the square, it can be used to solve any quadratic equation written in standard form.

**Quadratic Formula:**

A quadratic equation written in the form $ax^{2}+bx+c=0$ has the solutions $\frac{-b+\sqrt{b^{2}-4ac}}{2a}$ and $\frac{-b-\sqrt{b^{2}-4ac}}{2a}$.

Use the quadratic formula to solve the equation. Give the answers in exact form using simplified radicals as needed.

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| a. $x^{2}+4x-1=0$ | b. $3x^{2}+10=16x$ |

|  |  |
| --- | --- |
| c. $4x^{2}=x+5$ | d. $2x^{2}+3x+4=0$ |

# Objective 2: Using the Discriminant

In the quadratic formula, the value of the radicand, $b^{2}-4ac$, tells us the number of real solutions of the corresponding quadratic equation. This value is called the **discriminant.**

**Discriminant:**

For a quadratic equation of the form $ax^{2}+bx+c=0$,

* when $b^{2}-4ac>0$, the quadratic equation has two real solutions.
* when $b^{2}-4ac=0$, the quadratic equation has one real solution.
* when $b^{2}-4ac<0$, the quadratic equation has no real solutions.

Use the discriminant to determine the number of real solutions of the quadratic equation.

|  |  |
| --- | --- |
| a. $-x^{2}+12x-7=0$ | b. $5=4x-3x^{2}$ |